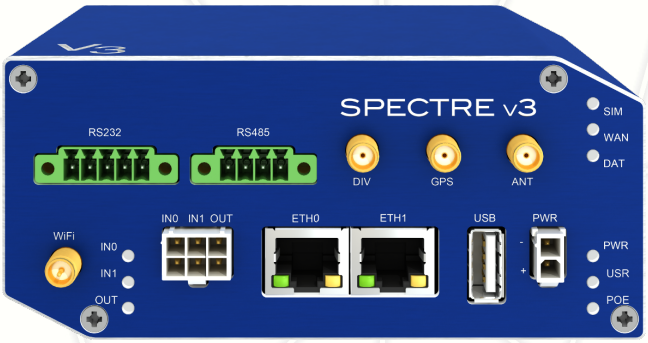
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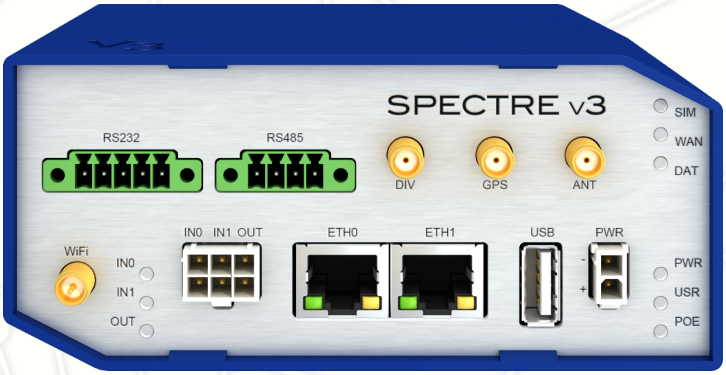
ENABLING CONNECTED INTELLIGENCE

Cellular router

SPECTRE v3 LTE

USER'S MANUAL





ENABLING CONNECTED INTELLIGENCE

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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following 2 conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Used Symbols



Danger – important notice, which may have an influence on the user's safety or the function of the device.

Attention – notice on possible problems, which can arise in specific cases.



Information, notice – information, which contains useful advice or special interest.

GPL License

Source codes under GPL license are available free of charge by sending an email to:

info@conel.cz.

Conel s.r.o., Sokolska 71, 562 04 Usti nad Orlici, Czech Republic
Manual Rev. 1 issued in CZ, June 8, 2015

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1. Safety Instruction

Please, observe the following instructions:

- THIS EQUIPMENT IS SUITABLE FOR USE IN CLASS I, DIVISION 2, GROUPS A, B, C, AND D HAZARDOUS LOCATIONS, OR NON-HAZARDOUS LOCATIONS ONLY.
- WARNING – EXPLOSION HAZARD – DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN REMOVED OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.
- WARNING – EXPLOSION HAZARD – SUBSTITUTION OF ANY COMPONENTS MAY IMPAIR SUITABILITY FOR CLASS I, DIVISION 2.
- CET ÉQUIPEMENT EST CONVENABLE EN CLASSE 1, DIVISION 2, GROUPES A, B, C, ET D ENDROITS DANGEREUX OU ENDROITS NON DANGEREUX SEULEMENT.
- AVIS – RISQUE D'EXPLOSION – NE DÉCONNECTEZ PAS L'ÉQUIPEMENT, SAUF SI L'ALIMENTATION A ÉTÉ COUPÉE OU SI L'ENVIRONMEMENT EST CLASSÉ NON DANGEREUX.
- AVIS – RISQUE D'EXPLOSION - SUBSTITUTION DE TOUTE COMPOSANTE RISQUERAIT LA QUALITÉ POUR CLASSE 1, DIVISION 2.
- The router must be used in compliance with all applicable international and national laws and in compliance with any special restrictions regulating the utilization of the router in prescribed applications and environments.
- To prevent possible injury and damage to appliances and to ensure compliance with all relevant provisions, use only the original accessories. Unauthorized modifications or the use of unapproved accessories may result in damage to the router and a breach of applicable regulations. Unauthorized modifications or use of unapproved accessories may void the warranty.
- The router can not be opened.
- Turn off the router and disconnect it from power supply before handling of the SIM card.
- **Caution!** The SIM card could be swallowed by small children.
- Input voltage must not exceed 60 V DC max.
- Do not expose the router to extreme ambient conditions. Protect the router against dust, moisture and high temperature.
- The router should not be used in locations where flammable and explosive materials are present, including gas stations, chemical plants, or locations in which explosives are used. We remind the users of the duty to observe the restrictions concerning the utilization of radio devices at such places.

- Switch off the router when travelling by plane. Utilization of the router in a plane may endanger the operation of the plane or interfere with the mobile telephone network, and may be unlawful. Failure to observe these instructions may result in the suspension or cancellation of telephone services for the respective client, or, it may result in legal sanctions; it may also result in both eventualities.
- When using the router in the close proximity of personal medical devices, such as cardiac pacemakers or hearing aids, you must proceed with heightened caution.
- The router may cause interference when in the close proximity of TV sets, radio receivers or personal computers.
- It is recommended that you should create an appropriate copy or backup of all the important settings that are stored in the memory of the device.

2. Product Disposal Instructions

The WEEE (Waste Electrical and Electronic Equipment: 2002/96/EC) directive has been introduced to ensure that electrical/electronic products are recycled using the best available recovery techniques to minimize the impact on the environment. This product contains high quality materials and components which can be recycled. At the end of it's life this product MUST NOT be mixed with other commercial waste for disposal. Check the terms and conditions of your supplier for disposal information.

3. Router Description

Cellular router SPECTRE v3 LTE is designed for wireless communication in mobile networks that make use of LTE, HSPA+, UMTS, EDGE or GPRS technology. Due to the high speed of data transfer up to 100 Mbit/s (download) and up to 50 Mbit/s (upload) is this router an ideal solution for wireless connection of traffic and security camera systems, individual computers, LAN networks, automatic teller machines (ATM) and other self-service terminals.

As a standard, cellular router is equipped with two Ethernet 10/100, one USB 2.0 Host port, two binary inputs and one output (I/O connector). The device also has two readers for 3 V and 1.8 V SIM cards, which are placed on the rear panel of the router. An integral part of the router is also a memory card reader. This reader allows SPECTRE v3 LTE to operate with microSD cards and increase storage space of the router up to 64 GB (32 GB in case of SDHC cards). The router can be equipped with WiFi module on customer's request, however it is not possible to add it to the router at some time in the future. Richer range of interfaces is available in versions containing one of these ports: SWITCH – three switched Ethernets; RS232 – serial interface; RS232-RS485/422 – combination of serial interface RS232 and RS485/422. SPECTRE v3 LTE is supplied either in a plastic or metal casing, based on the requirements of the customer.

For configuration of the cellular router is available web interface protected by password. Web interface provides (after logging in) detailed statistics about the router activities, signal strength, detailed system log etc. This device supports the creation of VPN tunnels using technologies IPSec, OpenVPN and L2TP for secure communications. There are also supported functions such as DHCP, NAT, NAT-T, DynDNS, NTP, VRRP, control by SMS, backup primary connection and many other functions.

Other diagnostic functions ensuring continuous communication include automatic inspection of PPP connection offering an automatic restart feature – in case of connection losses, or hardware watchdog which monitors the status of the router. Using a special window (start up script window) you may insert Linux scripts for various actions. For some applications is crucial the possibility to create several different configurations for one router. These configurations can be switched as necessary (for example using SMS, binary input status, etc.). Cellular wireless routers SPECTRE v3 LTE may automatically upgrade configuration and firmware from server. This allows mass reconfiguration of many routers in one time.

For further facilitating of workikg with routers can be used any additional software, e.g. R-SeeNet for permanent traffic monitoring of routers.

Examples of possible applications

- mobile office
- fleet management
- security system
- telematic
- telemetric
- remote monitoring
- vending and dispatcher machines

3.1 Usage of the Router

The router is primarily intended for these four basic situations:

I. Access to the Internet from LAN

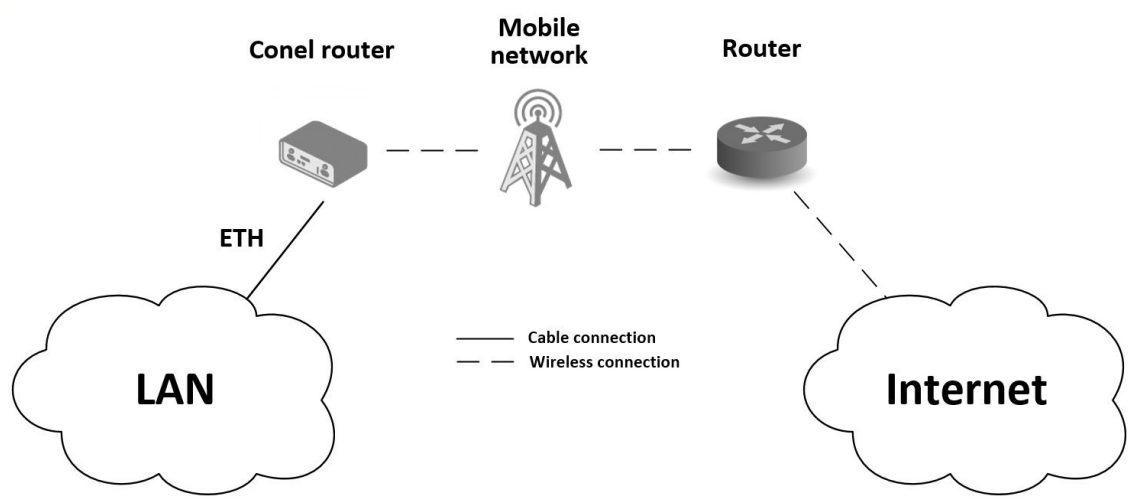


Figure 1: Access to the Internet from LAN

II. Backed up access to the Internet (from LAN)

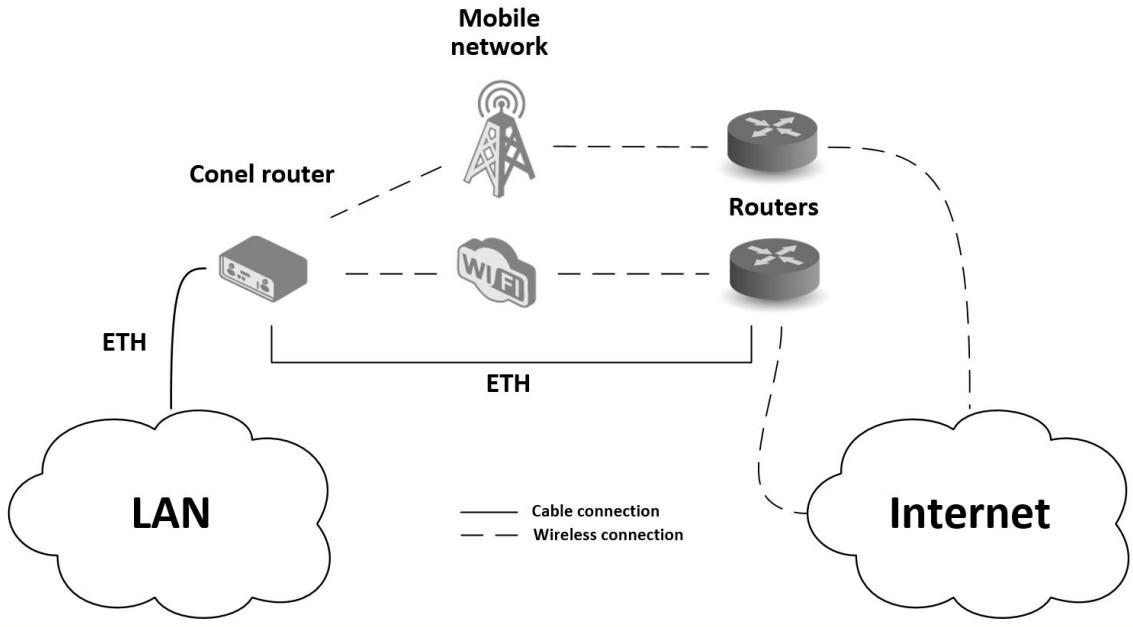


Figure 2: Backed up access to the Internet

III. Secure networks interconnection or using VPN

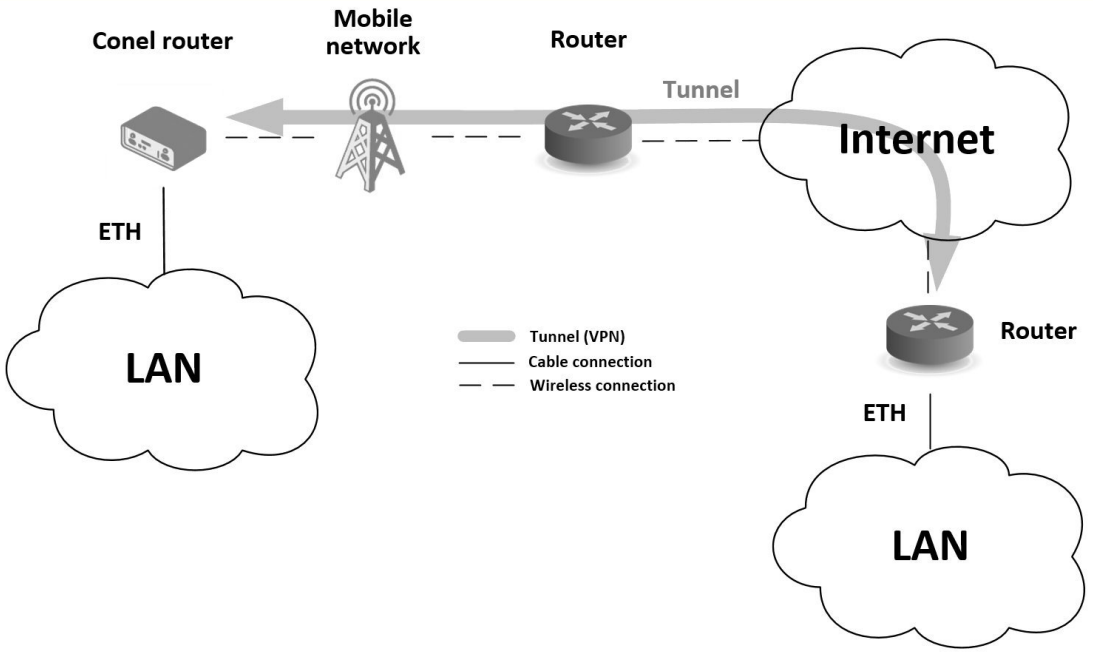


Figure 3: Using VPN tunnel

IV. Serial Gateway

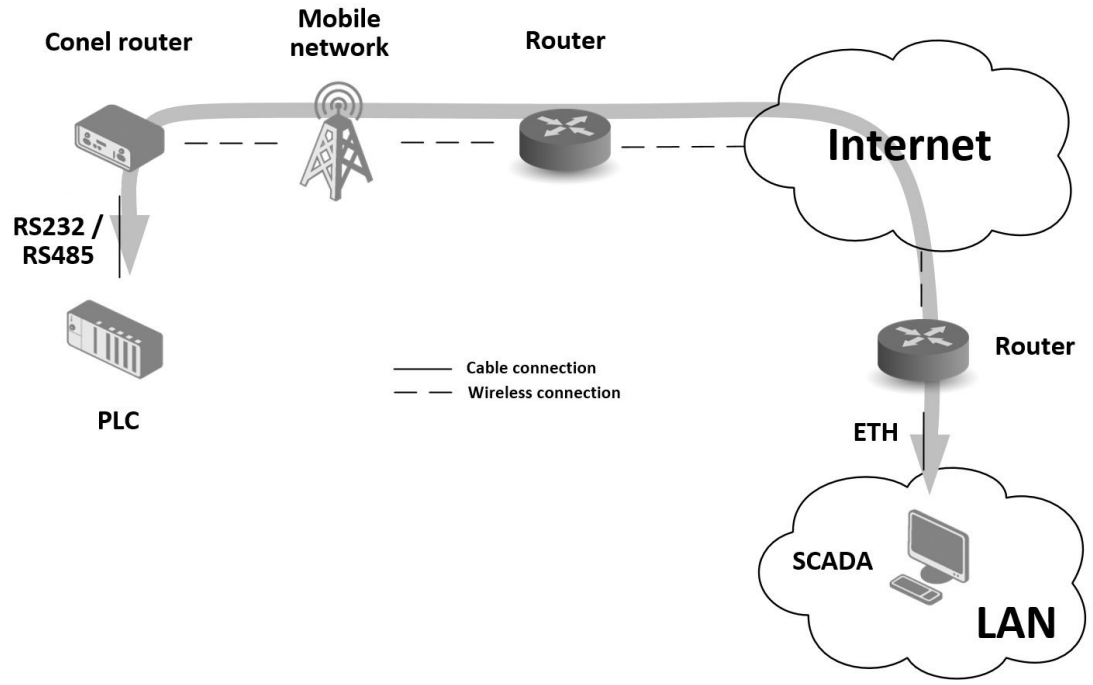


Figure 4: Serial Gateway

4. Contents of Package

Basic delivered set of router includes:

- router,
- power supply,
- crossover UTP cable,
- up to three external antennas,
- loose power and I/O connector (+8 pins[1]),
- 4-pins and 5-pins terminal block for RS485 and RS232 (**only for version with interface RS232-RS485/422**),
- clip for the DIN rail,
- paper start guide.



Figure 5: Contents of package

[1]These pins are designed for cables with a diameter from 0.2 to 0.8 mm^2

5. Router Design

5.1 Router versions

SPECTRE v3 LTE router is supplied in the following versions (see table below). All versions are available in plastic or metal box according to customer requirements.

Router versions	SIM	BIN	BOUT	USB	SD	ETH	WiFi	232	485
Basic version	2 x	2 x	1 x	1 x	1 x	2 x			
Basic version with WiFi	2 x	2 x	1 x	1 x	1 x	2 x	1 x		
Version with SWITCH board	2 x	2 x	1 x	1 x	1 x	5 x			
Version with SWITCH board & WiFi	2 x	2 x	1 x	1 x	1 x	5 x	1 x		
Version with RS232 board	2 x	2 x	1 x	1 x	1 x	2 x		1 x	
Version with RS232-RS485/422 board	2 x	2 x	1 x	1 x	1 x	2 x		1 x	1 x
Version with RS232-RS485/422 & WiFi	2 x	2 x	1 x	1 x	1 x	2 x	1 x	1 x	1 x

Table 1: Router versions

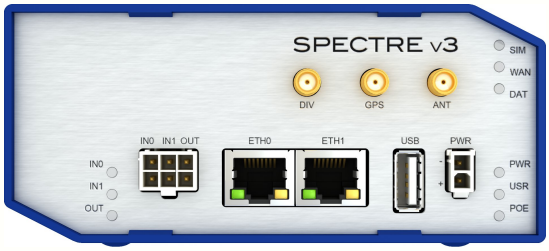


Figure 6: Basic version (plastic)



Figure 8: Basic version (metal)

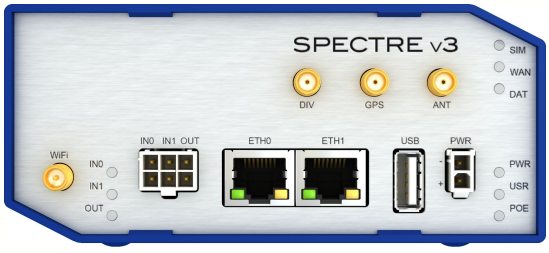


Figure 7: Basic version with WiFi (plastic)

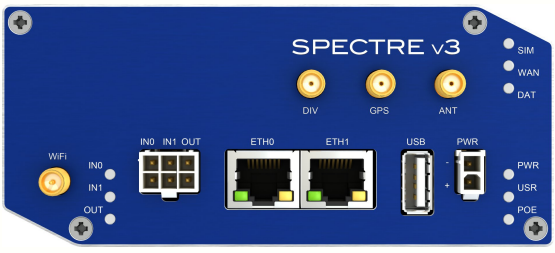


Figure 9: Basic version with WiFi (metal)



Figure 10: Version SWITCH (plastic)



Figure 15: Version SWITCH (metal)



Figure 11: Version SWITCH and WiFi (plastic)



Figure 16: Version SWITCH and WiFi (metal)

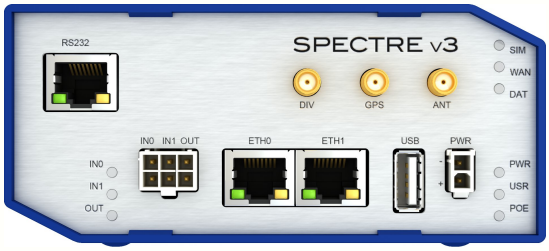


Figure 12: Version RS232 (plastic)



Figure 17: Version RS232 (metal)

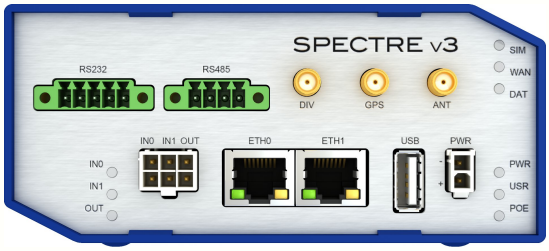


Figure 13: Version RS232-RS485 (plastic)



Figure 18: Version RS232-RS485 (metal)

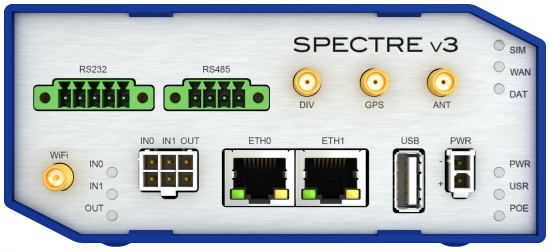


Figure 14: Ver. RS232-RS485 & WiFi (plastic)



Figure 19: Version RS232-RS485 & WiFi (metal)

5.2 Delivery identification

Trade name	Type name	Other
SPECTRE v3 LTE	SPECTRE-v3-LTE	Router in a plastic or metal box

Table 2: Delivery identification

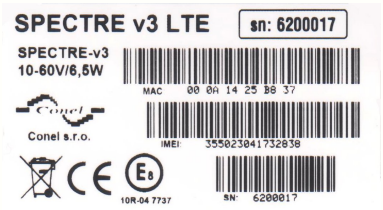


Figure 20: Label example

5.3 Ordering codes

Ordering codes overview is shown in the table below.

Name	Order code	Features – interfaces
SPECTRE v3 LTE set	SR3xx000yz*	LTE module, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader
SPECTRE v3 LTE set	SR3xx100yz*	LTE module, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, WiFi
SPECTRE v3 LTE set	SR3xx001yz*	LTE module, 5x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader
SPECTRE v3 LTE set	SR3xx101yz*	LTE module, 5x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, WiFi
SPECTRE v3 LTE set	SR3xx002yz*	LTE module, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, RS232
SPECTRE v3 LTE set	SR3xx003yz*	LTE module, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, RS232, RS485
SPECTRE v3 LTE set	SR3xx103yz*	LTE module, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, WiFi, RS232, RS485

Table 3: Ordering codes overview

* Replace the letters "xx", "y" and "z" with the values from the tables on the following page.

Letters "xx" – type of the LTE module

Type of the LTE module	Number "xx" in code
LTE module for EMEA	03
LTE module for NAM, AT&T operator	04
LTE module for Australia	06
LTE module supports frequency 450 MHz	07

Table 4: Type of the LTE module

Letter "y" – type of the router box

Type of box	Number "y" in code
Plastic	1
Metal	2

Table 5: Type of router box

Letter "z" – type of the power supply connector

Type of power supply	Number "z" in code
Europe	1
UK & Ireland	2
Australia	3
North America	4

Table 6: Type of power supply

Examples of complete order code:

Order code	Features – interfaces	Box	Power supply
SR30300011	LTE module for EMEA, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader	plastic	Europe
SR30300122	LTE module for EMEA, 5x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader	metal	UK & Ireland
SR30410124	LTE module for NAM AT&T, 5x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, WiFi	metal	North America
SR30600213	LTE module for Australia, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, RS232	plastic	Australia
SR30710021	LTE module supports 450 MHz, 2x ETH, 1x USB, 2x BI, 1x BO, 1x microSD reader, 2x SIM reader, WiFi	metal	Europe

Table 7: Examples of order code



You can use the ordering codes configurator on the www.conel.com web pages.

5.4 Basic dimensions of router box

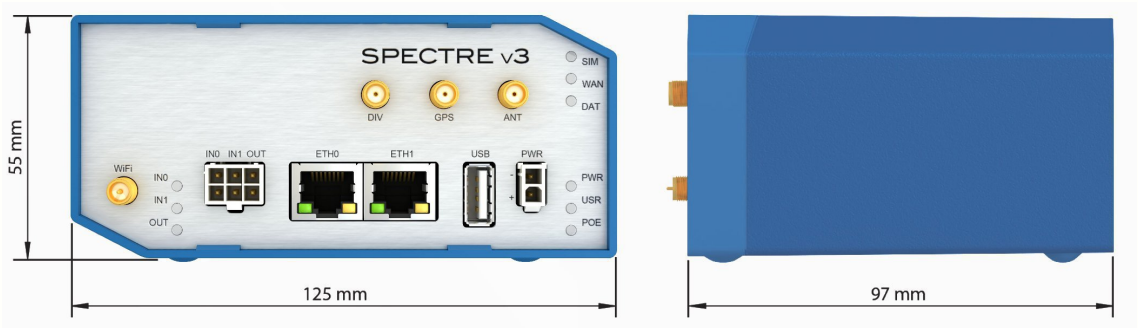


Figure 21: Basic dimensions of router box

5.5 Mechanical dimensions and mounting recommendations

Mounting recommendations:

- possibility to be put on a work surface,
- DIN rail with clips CPD3 (or CKD2 for metal version) are included.

For the most of applications with a built-in router in a switch board it is possible to recognize two kinds of environments:

- no public and industry environment of low voltage with high interference,
- public environment of low voltage without high interference.

For both of these environments it is possible to mount router to a switch board, the following there is no need to have examination immunity or issues in connection with EMC according to EN 60439-1 ed.2:00 + A1:04.

For compliance of EN 60439-1 ed.2:00 + A1:04 specification it is necessary to observe next assembly of the router to the switch – board:

- For whip antennas we recommend to observe a distance of 6 cm from cables and metal surfaces on every side due to the elimination of interference. While using an external antenna except for the switch-board it is necessary to fit a lightening conductor.
- Before mounting a router on sheet-steel we recommend using a "cable" antenna.
- For every cables we recommend to bind the bunch, we recommend for this use:
  - Length of the bunch (combination of power supply and data cables) can be maximum 1.5 m. If the length of data cables exceeds 1.5 m or in the event of, the cable leads towards the switch – board. We recommend installing over – voltage protectors (surge suppressors).

  - With data cables they mustn't carry cables with reticular tension ~ 230 V/50 Hz.

- Sufficient space must be left before individual connectors for handling of cables,
- For correct function of the router we recommend to use in the switch-board earth-bonding distribution frame for grounding of power supply of router, data cables and antenna.

5.6 Removing from the DIN rail

Default position of CPD3 holder (or CKD2 holder for metal version), which is used for mounting the router on a DIN rail, is shown in the following figure:

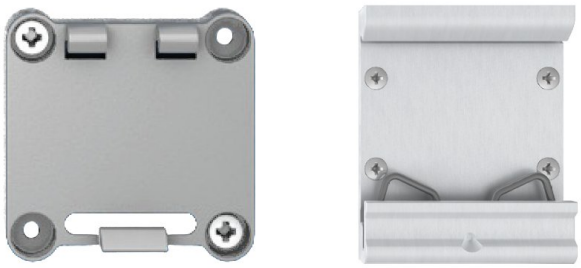


Figure 22: Default position of DIN holder

For removing from the DIN rail it is necessary to lightly push upward the router so that the top part of the CPD3 holder (or CKD2 for metal version) hitched to the DIN rail get out of this rail and then fold out the top part of the router away from the DIN rail.

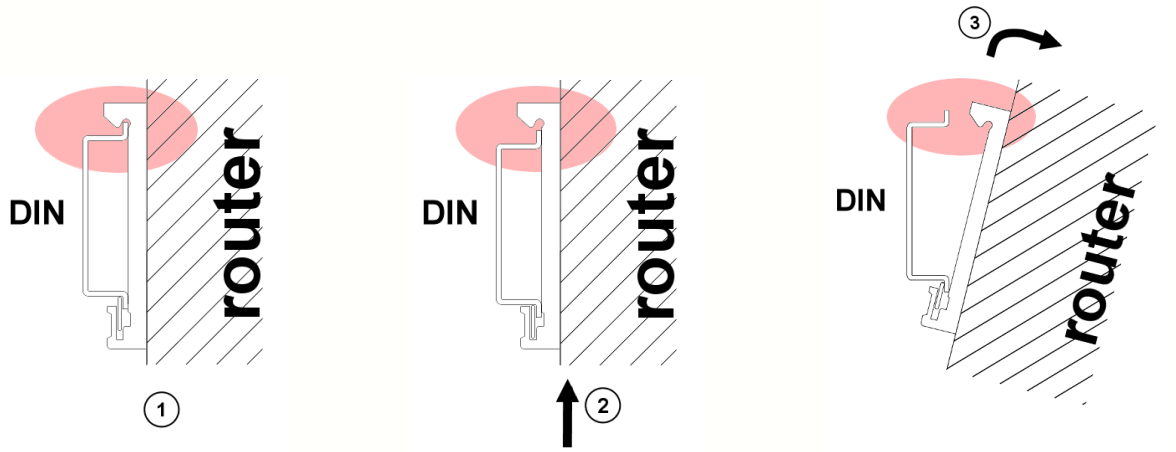


Figure 23: Removing from the DIN rail

5.7 Description of the rear panel

The rear panel contains only two holders for SIM cards (*SIM1* and *SIM2*), holder for SD card (*SD*) and *RST* button used to restore default configuration and reboot the router.

5.8 Description of the front panel

On the front panel is the following:

Caption	Connector	Description
PWR	2-pin	Connector for the power supply
ETH0	RJ45	Connector for connection into the computer network
ETH1	RJ45	Connector for connection into the computer network
ANT	SMA	Connector for main antenna
DIV	SMA	Connector for diversity antenna
GPS	SMA	Connector for GPS antenna
WiFi	R-SMA	Connector for WiFi antenna (**only for versions with WiFi module!**)
USB	USB-A 2.0 Host	Connector for connection of USB devices to the router. Supports devices with PL-2303 and FTDI USB/RS232 converters.
I/O	6-pin	Connector for connection of the binary inputs and output

Table 8: Front panel description

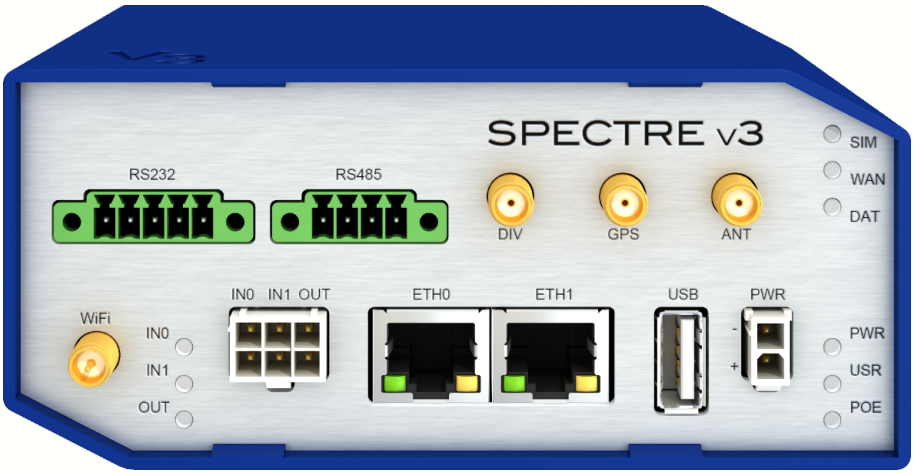


Figure 24: SPECTRE v3 LTE front panel

5.8.1 Status indication

About router status inform nine LED indicators on the front panel. Each ETH port has two additional LEDs that provide information about port status.

Caption	Color	State	Description
PWR	Green	Blinking On Fast blinking	Router is ready Starting of the router Updating firmware
USR	Yellow	—	Function of this LED diode can be selected by user
POE	Yellow Green	—	—
SIM	Yellow Green	On (Yellow color) On (Green color)	The first SIM card is active The second SIM card is active
WAN	Yellow	1x flash per sec. 2x flash per sec. 3x flash per sec.	Signal strength is from –50 dBm to –69 dBm Signal strength is from –70 dBm to –89 dBm or difference between neighbours cells is exactly 3 dBm Signal strength is from –90 dBm to –113 dBm or difference between neighbours cells is smaller than 3 dBm
DAT	Red	Blinking	Communication in progress on radio channel
IN0	Green	On	Binary input no. 0 is active
IN1	Green	On	Binary input no. 1 is active
OUT	Yellow	On	Binary output is active
ETH0 ETH1	Green	On Off	Selected 100 Mbit/s Selected 10 Mbit/s
ETH0 ETH1	Yellow	On Blinking Off	The network cable is connected Data transmission The network cable is not connected

Table 9: Status indication



State indication of WAN LED is updated every 10 seconds.

5.8.2 Power connector PWR

Panel socket 2-pin.

Pin number	Signal mark	Description
1	GND(-)	Negative pole of DC supply voltage
2	VCC(+)	Positive pole of DC supply voltage (+10 to +60 V DC)

Table 10: Connection of power connector

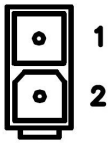


Figure 25: Power connector

Power supply for router must be between +10 V to +60 V DC supply. Protection against reversed polarity without signaling is built into the router.

SPECTRE v3 LTE can be put into low power mode using a special command. Then it can be awakened for example by an activity on binary input or using an internal timer.

Circuit example:

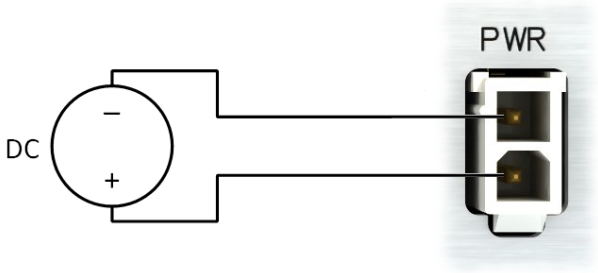


Figure 26: Connection of power supply

5.8.3 Antenna connector ANT, DIV, GPS and WiFi

Main, diversity and GPS antennas are connected to the router using the SMA connector on the front panel. There is also available R-SMA antenna connector through which the additional antenna can be connected, if the router is equipped with WiFi module.

ANT connector is used to connect the main antenna router. To connect the diversity antenna is used the second antenna connector DIV. The third connector (GPS) is intended for GPS antenna (router supports active GPS antenna). R-SMA connector named WiFi is designed for connection of WiFi antenna (available only for versions with WiFi module).

The router can not operate without connected main antenna marked as ANT!

For connection the antenna is used SMA connector. The antenna is connected by screwing this antenna to the SMA connector on the front panel of the router (see figure below).

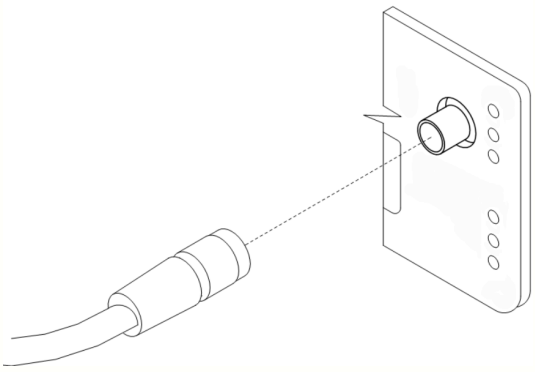


Figure 27: Connecting of the antenna

Diversity antenna improves radio features of the router at low signal strength.

5.8.4 SIM card reader

Two SIM card readers for 3 V and 1.8 V SIM cards are placed on the rear panel of the router. For getting the router to work is necessary to insert an activated SIM card with an unblocked PIN code. The SIM cards might be of different adjusted APN (Access Point Name).

Changing the SIM card:

- Before handling of the SIM card disconnect the router from power supply!
- Use a plastic opening tool, or your fingernail, to press the SIM card slightly deeper into its slot until you hear a click.
- After the click, release the card and it will pop out of its slot.
- Remove the SIM card and push any other SIM card into the slot until it clicks in place.

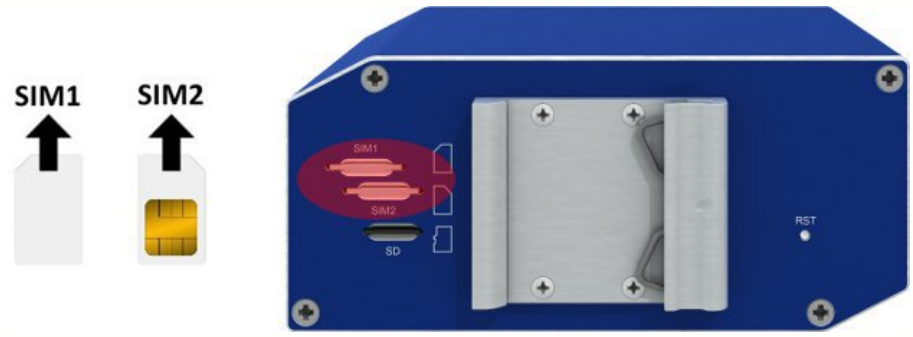


Figure 28: SIM cards

5.8.5 MicroSD card reader

The microSD card reader is placed on the rear panel of the router (the third slot). This card reader allows the router to operate with memory cards microSD. Technical specifications are stated in the table below.

Technical specifications of microSD card		
Supported technologies		SDHC, SDXC
Supported capacity	SDHC SDXC	up to 32 GB from 32 GB to 64 GB

Table 11: Technical specifications of microSD card

Changing the microSD card:

- Use the flat end of a spudger, or your fingernail, to press the microSD card slightly deeper into its slot until you hear a click.
- After the click, release the card and it will pop out of its slot.
- Remove the microSD card and push any other microSD card into the slot until it clicks in place.



Figure 29: SD card

5.8.6 Ethernet Port (ETH0 and ETH1)

Panel socket RJ45.

Pin	Signal mark	Description	Data flow direction
1	TXD+	Transmit Data – positive pole	Input/Output
2	TXD-	Transmit Data – negative pole	Input/Output
3	RXD+	Receive Data – positive pole	Input/Output
4	DC+	POE power + (if POE is equipped)	
5	DC+	POE power + (if POE is equipped)	
6	RXD-	Receive Data – negative pole	Input/Output
7	DC-	POE power - (if POE is equipped)	
8	DC-	POE power - (if POE is equipped)	

Table 12: Connection of Ethernet connector

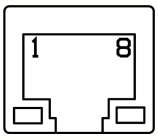


Figure 30: Ethernet connector

Ethernet cable plug into the RJ45 connector labeled as ETH0 or ETH1 (see figure below).

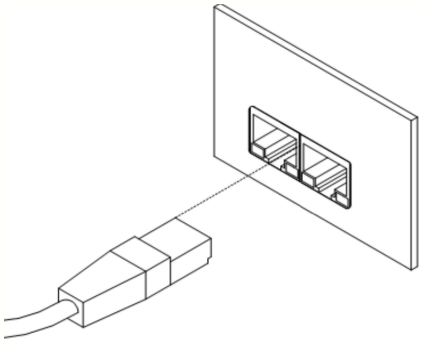


Figure 31: Connection of ethernet cable

The insulation strength is up to 1.5 kV.

5.8.7 USB Port

Panel socket USB-A.

Pin	Signal mark	Description	Data flow direction
1	+5 V	Positive pole of 5 V DC supply voltage, 0.5 A	
2	USB data -	USB data signal – negative pole	Input/Output
3	USB data +	USB data signal – positive pole	Input/Output
4	GND	Negative pole of DC supply voltage	

Table 13: Connection of USB connector

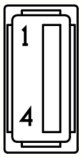


Figure 32: USB connector

5.8.8 I/O Port

Panel socket 6-pin.

Pin	Signal mark	Description
1	IN0	Binary input 0
2	IN0	Binary input 0
3	IN1	Binary input 1
4	IN1	Binary input 1
5	OUT	Binary output
6	OUT	Binary output

Table 14: Connection of I/O port

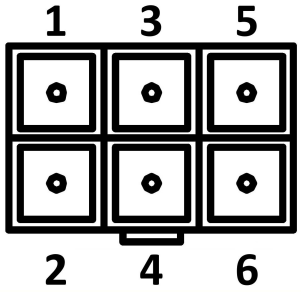


Figure 33: I/O connector

I/O user Interface is designed for processing of binary input and control (setting) binary output. Binary output is open in the default configuration. Insulation strength is 1.5 kV. The pins are isolated from each other with the same strength.

The input circuits are bipolar and allow connection as needed with common plus or minus (according to connection of an external voltage).

Binary inputs

- Characteristics of inputs:

logical 0 / 1	Voltage	Current
log. 0 max	3 V	0.4 mA
log. 1 min	5 V	0.7 mA
log. 1 type	12 V	2 mA
log. 1 max	60 V	7 mA

Table 15: Characteristics of inputs

- Binary inputs connection with example:

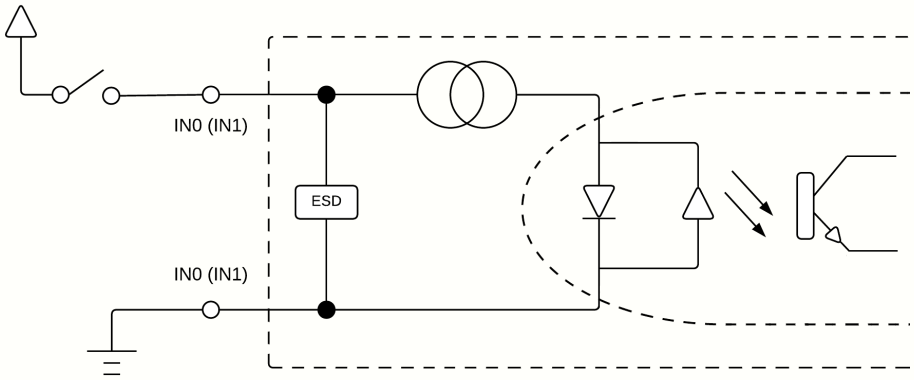


Figure 34: Binary inputs connection

Binary output

- Binary output parameters:
  - 60 V AC / 300 mA
  - 60 V DC / 300 mA
- Current of binary output is limited by a resettable fuse (300 mA).
- Binary output connection with example:

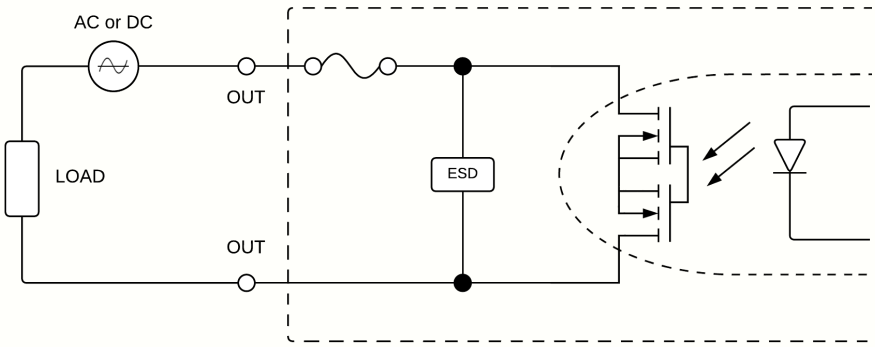


Figure 35: Binary output connection

5.8.9 Reset

When *PWR* LED starts flashing on the front panel, it is possible to restore the default configuration of the router by pressing the *RST* button on the rear panel. After pressing this button the default configuration is restored and then router reboots (green LED will be on).

For pressing the *RST* button could be used a narrow screwdriver.

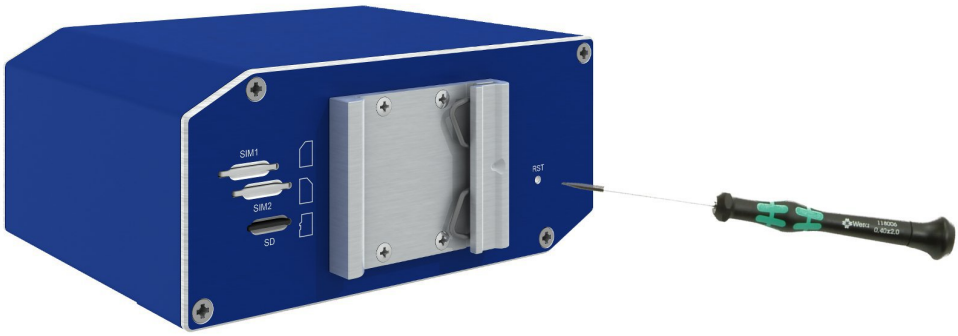


Figure 36: Router reset

We recommend backing up configuration of the router (see *Configuration manual*) because reset of the router sets the configuration to the default state.

It is important to distinguish between reset and reboot the router.

Action	Router behavior	Invoking events
Reboot	Turn off and then turn on router	Disconnect and connect the power, Press the *Reboot* button in the web configuration
Reset	Restore default configuration and reboot the router	Press *RST* button

Table 16: Description of reset and restart router

5.9 Interfaces description

Besides the basic version of SPECTRE v3 router there are available versions with one of the following interfaces:

- RS232 interface
- RS232-RS485/422 interface
- SWITCH interface

5.9.1 RS232 interface

This interface is physically connected on RJ45 connector. RS232 converter is protected against overload the bus.

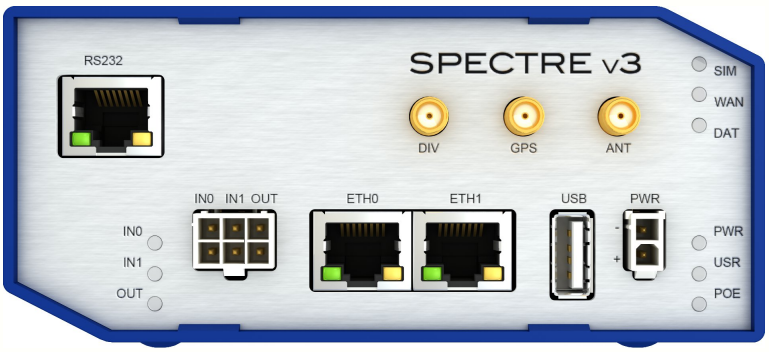


Figure 37: Version with RS232 interface

Connection of connector:

Pin	Signal	Description	Direction
1	RTS	Request To Send	Input
2	CTS	Clear To Send	Output
3	DTR	Data Terminal Ready	Input
4	DSR	Data Set Ready – connect to +3 V through R 330 Ohm	Output
5	GND	Signal ground	
6	TXD	Transmit Data	Output
7	CD	Carrier Detect	Output
8	RXD	Receive Data	Input

Table 17: Connection of RS232 connector

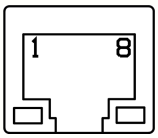


Figure 38: RS232 connector

Example of a meter connection to router:

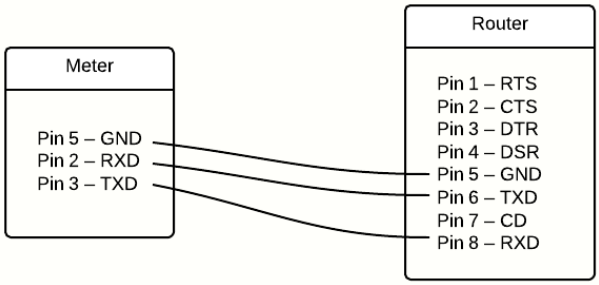


Figure 39: Meter connection to router

State indication of RS232 port:

Description of indication	
Green LED	Indicates Receive data
Yellow LED	Indicates Transmit data

Table 18: State indication of RS232 port

5.9.2 RS232-RS485/422 interface

These interfaces are physically connected on five-pin and four-pin terminal block connectors. The insulation strength is up to 2.5 kV. **Attention, connectors are not isolated from each other!**

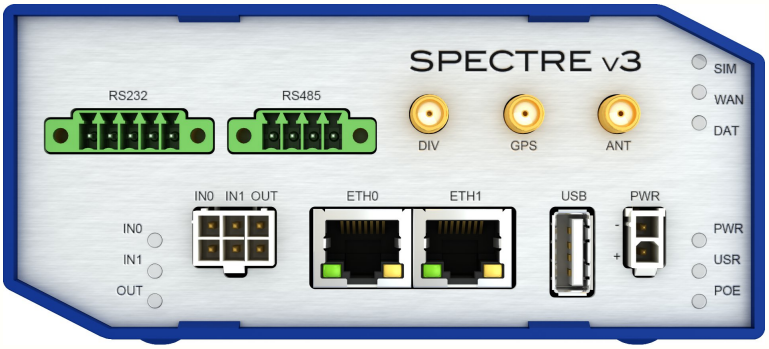


Figure 40: Version with RS232-RS485/422 interface

Connection of RS232 connector:

Pin	Signal	Description	Direction
1	$\overline{\text{CTS}}$	Clear To Send	Output
2	$\overline{\text{RTS}}$	Request To Send	Input
3	GND	Signal ground*	—
4	RXD	Receive Data	Input
5	TXD	Transmit Data	Output

Table 19: Connection of RS232 connector

* *Both connectors (RS232 and RS485/422) have common ground.*

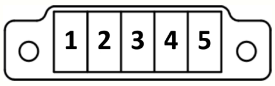


Figure 41: RS232 connector

Connection of RS485 connector:

Pin	Signal	Description	Direction
1	TxRx+	RS485 B (+)	Input/Output
2	TxRx-	RS485 A (-)	Input/Output
3	TxRx+	RS485 B (+)	Input/Output
4	TxRx-	RS485 A (-)	Input/Output

Table 20: Connection of RS485 connector

Connection of RS422 connector:

Pin	Signal	Description	Direction
1	RxD+	RS422 (+)	Output
2	RxD-	RS422 (-)	Output
3	TxD+	RS422 (+)	Input
4	TxD-	RS422 (-)	Input

Table 21: Connection of RS422 connector

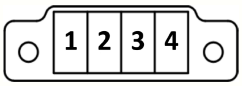


Figure 42: RS485/422 connector

Selection of RS485 or RS422 can be performed using jumpers on the board. Positions where jumpers have to be mounted are shown on the port (see figure below). Three jumpers for RS485 interface or one jumper for RS422 interface are required.

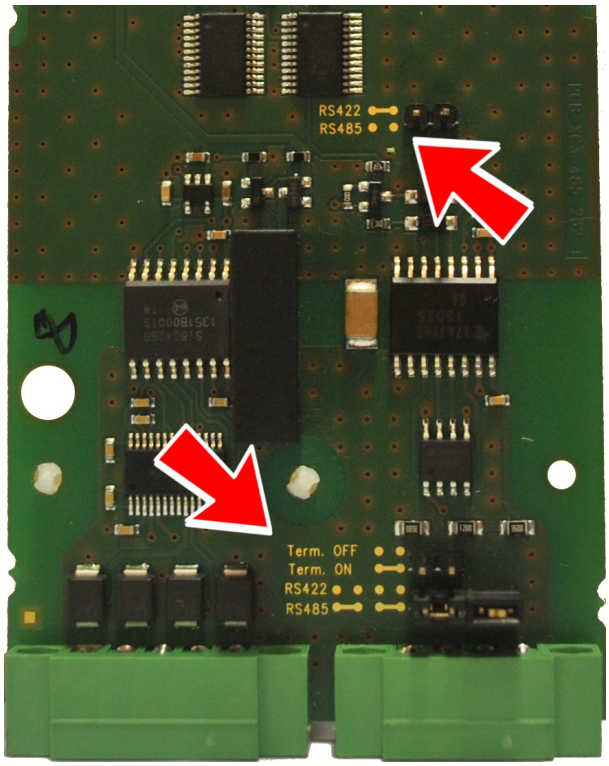


Figure 43: Connection of jumpers

5.9.3 SWITCH interface

Three LAN ports of SWITCH interface intended for v3 routers (RJ-45 connectors for connecting ethernet devices) act as it is a typical switch device. This means that the router with internal switch desk reads ethernet frames (a data packets on an ethernet link) from any port and transmits them on other ports of the switch board. Each port on the switch can transmit frames independently on every other port.



Figure 44: Version with SWITCH board

State indication of the port:

Description of indication		
Green LED	On Off	Selected 100 Mbit/s Selected 10 Mbit/s
Yellow LED	On Blinking Off	The network cable is connected Data transmission The network cable is not connected

Table 22: State indication of the port

6. First Use

6.1 Connecting the router before first use

Before putting the router into operation it is necessary to connect all components which are required to run your applications. Don't forget to insert SIM card.

The router can not operate without connected antenna, SIM card and power supply. If the antenna is not connected, router can be demaged.

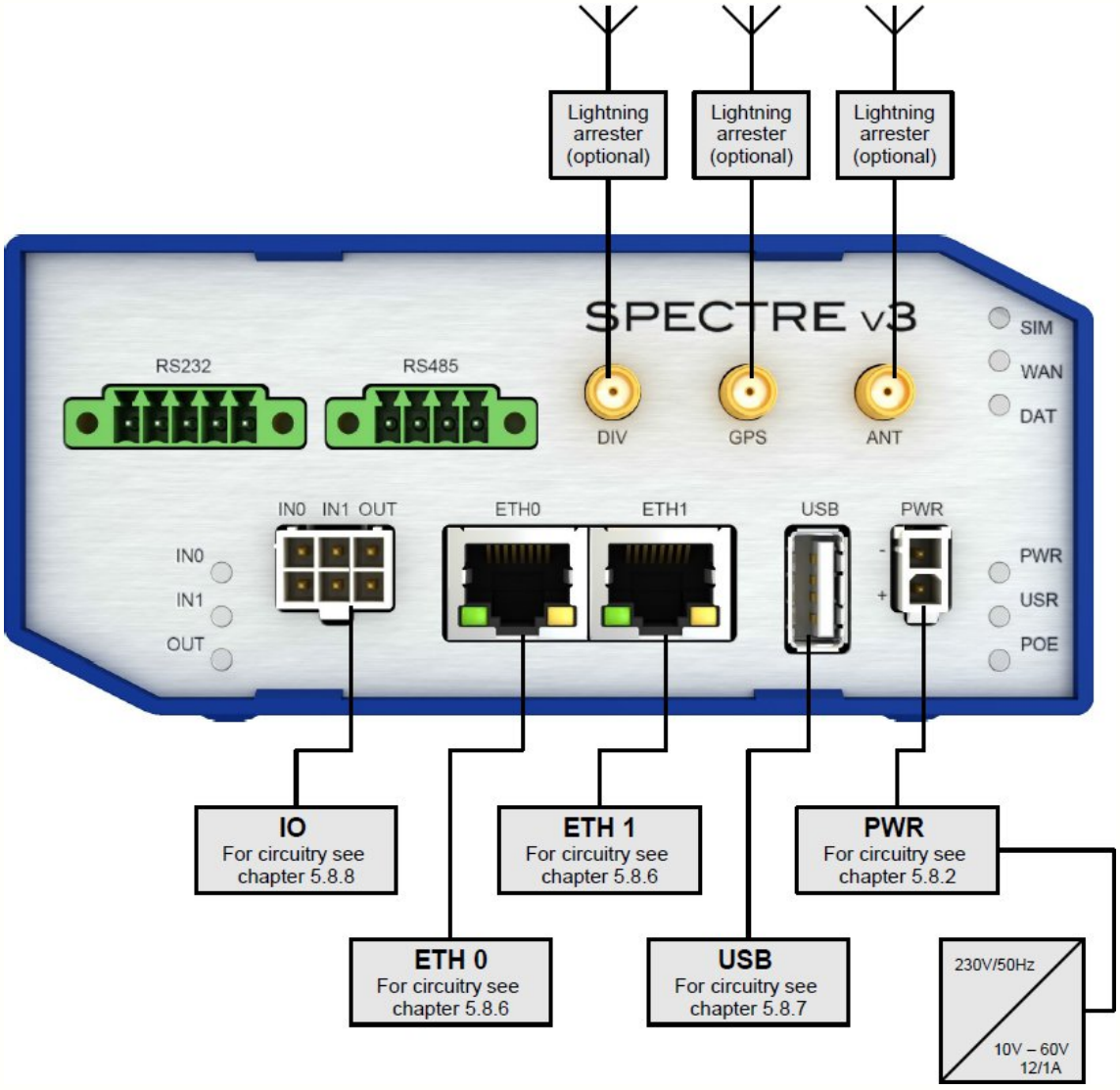


Figure 45: Router connection

6.2 Start

The router is put into operation when the power supply is connected to this router. By default, the router will automatically start to log on to the default APN. DHCP server will start to assign addresses for devices on the Ethernet port ETH0. Router behavior can be changed via the web interface. This is described in detail in the *Configuration manual*.

6.3 Configuration

Attention! If no SIM card is inserted in the router, it is not possible to operate. Inserted SIM card must have activated data transmission.

6.3.1 Configuration over web browser

For status monitoring, configuration and administration of the router is available a web interface which can be accessed by entering the IP address of the router into the web browser. The default IP address of the router is 192.168.1.1. **Attention, it is necessary to use HTTPS protocol for secure communication over a network!**

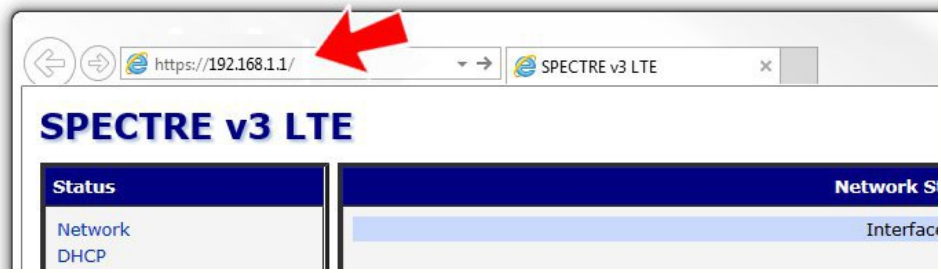


Figure 46: Entering the IP address of the router

Configuration may be performed only by the user "root" with default password "root".

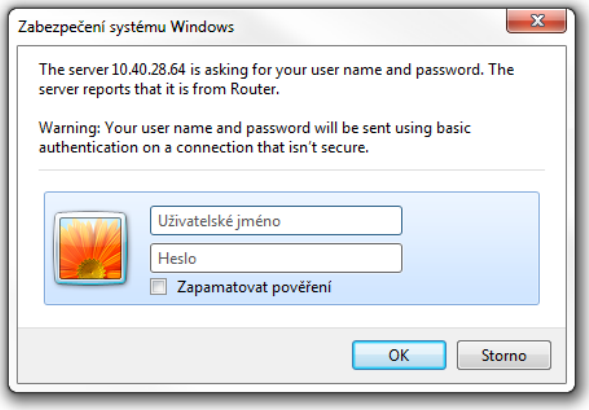


Figure 47: Entering login information

After successfully entering login information user gains access to the router via his internet browser.

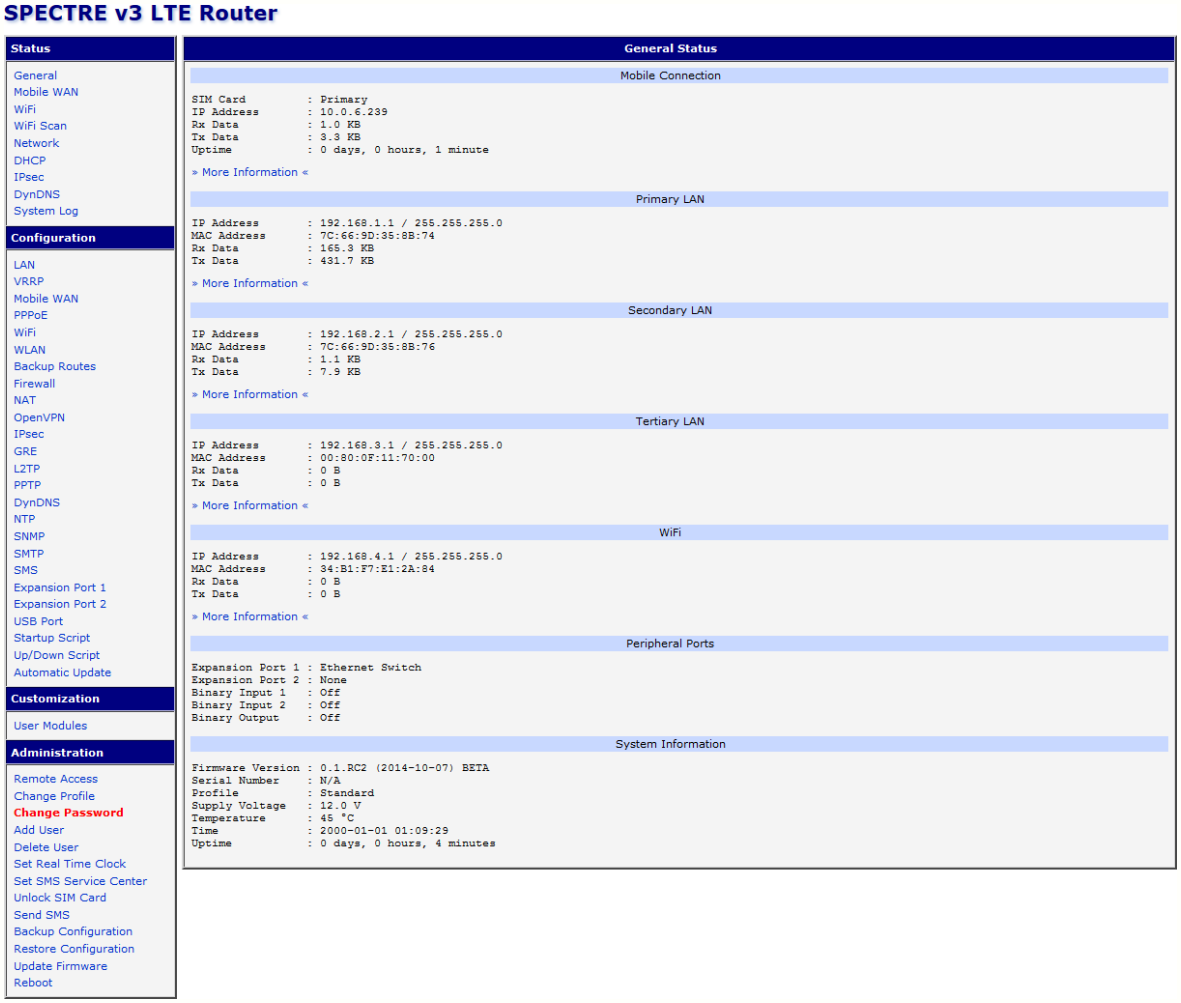


Figure 48: Router web interface

A detailed description of the router settings via the Web interface can be found in the document *Configuration manual for v3 routers*.

7. Technical Parameters

7.1 Basic parameters

SPECTRE v3 LTE		
Temperature range	Operating Storage	-40 °C to +75 °C -40 °C to +85 °C
Cold start	-35 °C -40 °C	Data transfers via mobile network are available immediately Data transfers via mobile network are available approximately in five minutes after the start of the router. Everything else is functional immediately.
Humidity	Operating Storage	0 to 95 % relative humidity non condensing 0 to 95 % relative humidity non condensing
Altitude	Operating	2000 m / 70 kPa
Degree of protection		IP30
Supply voltage		10 to 60 V DC
Consumption	Idle Average Peak Sleep mode	2,5 W 4 W 11 W 10 mW
Dimensions		55 x 97 x 125 mm (DIN 35 mm)
Weight	Plastic box Metal box	approximately 170 g (depends on interface) approximately 375 g (depends on interface)
Antenna connectors		SMA – 50 Ohm
User interface	2x ETH USB I/O	Ethernet (10/100 Mbit/s) USB 2.0 6-pin panel socket

Table 23: Basic parameters

7.2 Type tests and environmental conditions

Phenomena	Test	Description	Test levels
ESD	EN 61000-4-2	Enclosure contact Enclosure air	± 6 kV (crit. A) ± 8 kV (crit. A)
RF field AM modulated	IEC 61000-4-3	Enclosure	20 V/m (crit. A) (80 – 2700 MHz)
Fast transient	EN 61000-4-4	Signal ports Power ports Ethernet ports	± 2 kV (crit. A) ± 2 kV (crit. A) ± 2 kV (crit. A)
Surge	EN 61000-4-5	Ethernet ports Power ports I/O ports	± 2 kV (crit. B), shielded cabel ± 0,5 kV (crit. B) ± 1 kV, L to L (crit. A) ± 2 kV, L to GND (crit. A)
RF conducted	EN 61000-4-6	All ports	10 V/m (crit. A) (0,15 – 80 MHz)
Radiated emission	EN 55022	Enclosure	Class B
Conducted emission	EN 55022	DC power ports Ethernet ports	Class B Class B
Power frequency magnetic field	EN 61000-4-8	Enclosure	160 A/m (crit. A)
Dry heat	EN 60068-2-2	+75 °C [1], 40 % rel. humidity	
Cold	EN 60068-2-1	-40 °C [1]	
Dump heat	EN 60068-2-78	95 % rel. humidity (+40 °C)	
E8	10R – 04	EMC for vehicles	No.: 10R – 04 7737

Table 24: Type tests and environmental conditions

[1] The temperatures are given for basic version of the router. For example, if the router is equipped with WiFi module, values are slightly worse.

7.3 Technical parameters of module

7.3.1 LTE module for EMEA

LTE module for EMEA	
LTE parameters	Bit rate 100 Mbps (DL) / 50 Mbps (UL) 3GPP rel. 8 standard Supported bandwidths: 5 MHz, 10 MHz, 20 MHz Supported frequencies: 800 / 900 / 1800 / 2100 / 2600 MHz
HSPA+ parameters	Bit rate 21,1 Mbps (DL) / 5,76 Mbps (UL) 3GPP rel. 7 standard UE CAT. 1 to 6, 8, 10, 12, 14 3GPP data compression Supported frequencies: 900 / 2100 MHz
UMTS parameters	PS bit rate 384 kbps (DL) / 384 kbps (UL) CS bit rate 64 kbps (DL) / 64 kbps (UL) W-CDMA FDD standard Supported frequencies: 900 / 2100 MHz
GPRS/EDGE parameters	Bit rate 237 kbps (DL) / 59,2 kbps (UL) GPRS multislot class 10, CS 1 to 4 EDGE multislot class 12, CS 1 to 4, MCS 1 to 9 Supported frequencies: 900 / 1800 / 1900 MHz
Supported GPRS/EDGE power classes	EGSM 900: Class 4 (33 dBm) GSM 1800/1900: Class 1 (30 dBm) EDGE 900: Class E2 (27 dBm) EDGE 1800/1900: Class E2 (26 dBm)

Table 25: Technical parameters of module for EMEA

7.3.2 LTE module for NAM, AT&T operator

LTE module for NAM, AT&T operator	
LTE parameters	Bit rate 100 Mbps (DL) / 50 Mbps (UL), UE CAT. 3 3GPP rel. 9 standard Supported bandwidths: 5 MHz, 10 MHz, 20 MHz Supported frequencies: 700 / 850 / 1700+2100 (AWS) / 1900 MHz
HSPA+ parameters	Bit rate 42 Mbps (DL) / 5,76 Mbps (UL), UE CAT. 14, 24 3GPP rel. 8 standard 3GPP data compression Supported frequencies: 850 / 1700+2100 (AWS) / 1900 MHz
UMTS parameters	PS bit rate 384 kbps (DL) / 384 kbps (UL) W-CDMA FDD standard Supported frequencies: 850 / 1700+2100 (AWS) / 1900 MHz

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Continued from previous page

LTE module for NAM, AT&T operator	
GPRS/EDGE parameters	Bit rate 237 kbps (DL) / 59,2 kbps (UL) GPRS multislot class 12, CS 1 to 4 EDGE multislot class 12, CS 1 to 4, MCS 1 až 9 Supported frequencies: 850 / 900 / 1800 / 1900 MHz
Supported GPRS/EDGE power classes	EGSM 850/900: Class 4 (33 dBm) GSM 1800/1900: Class E2 (27 dBm) EDGE 850/900: Class E2 (27 dBm) EDGE 1800/1900: Class E2 (26 dBm)

Table 26: Technical parameters of module for NAM AT&T

7.3.3 LTE module for Australia

LTE module for Australia	
LTE parameters	Bit rate 100 Mbps (DL) / 50 Mbps (UL), UE CAT. 3 3GPP rel. 9 standard Supported bandwidths: 5 Mhz, 10 Mhz, 20 Mhz Supported frequencies: 800 / 900 / 1800 / 2100 / 2600 MHz
HSPA+ parameters	Bit rate 42 Mbps (DL) / 5,76 Mbps (UL), UE CAT. 24, 6 3GPP rel. 5, 6, 7, 8 standard Supported frequencies: 850 / 900 / 1900 / 2100 MHz
UMTS parameters	PS bit rate 384 kbps (DL) / 384 kbps (UL) 3GPP rel. 5, 6, 7, 8 standard W-CDMA FDD standard Supported frequencies: 850 / 900 / 1900 / 2100 MHz
GPRS/EDGE parameters	Data throughput max. 236 kbps 3GPP rel. 99 standard GPRS multislot class 10 EDGE multislot class 12 Coding schemes CS 1 to 4, MCS 1 to 9 Supported frequencies: 850 / 900 / 1800 / 1900 MHz
Supported GPRS/EDGE power classes	GSM 850 CS: Class 4 (32 dBm) EGSM 900 CS: Class E2 (27 dBm) DCS 1800 CS: Class 1 (29 dBm) PCS 1900 CS: Class E2 (26 dBm)

Table 27: Technical parameters of module for Australia

7.3.4 LTE module supports 450 MHz

LTE module supports 450 MHz	
LTE parameters	Bit rate 100 Mbps (DL) / 50 Mbps (UL), UE CAT. 3 3GPP rel. 9 standard Supported bandwidths: 5 Mhz, 10 Mhz, 20 Mhz Supported frequencies: 450 / 800 / 1800 / 2600 MHz Rated Output Power: B3, B7, B20, 31 MIMO (Multi-Input Multi-Output) antenna support
HSPA+ parameters	Bit rate 42 Mbps (DL) / 5,76 Mbps (UL), UE CAT. 24, 6 3GPP rel. 5, 6, 7, 8 standard Supported frequencies: 900 / 2100 MHz A maximum of ten HS-PDSCH channels
UMTS parameters	PS bit rate 384 kbps (DL) / 384 kbps (UL) 3GPP rel. 5, 6, 7, 8 standard W-CDMA FDD standard Supported frequencies: 900 / 2100 MHz Rated Output Power: Class 3 (900 MHz and 2100 MHz)
GPRS/EDGE parameters	3GPP rel. 99 standard Multislot Class 12 Coding schemes CS 1 to 4, MCS 1 to 9 Supported frequencies: 900 / 1800 MHz Rated Output Power GSM/GPRS 900 MHz: Class 4 Rated Output Power GSM/GPRS 1800 MHz: Class 1 Rated Output Power EDGE 900 / 1800 MHz: Class E2

Table 28: Technical parameters of LTE module 450 MHz

7.4 Technical parameters of GPS

GPS is not available when the router is equipped with the LTE module 450 MHz!

GPS specifications	
Antenna	50 Ohms – active
Protocols	NMEA 0183 v3.0
Frequency	1575.42 MHz
Sensitivity	Tracking: -161 dBm* Acquisition (Assisted): -158 dBm** Acquisition (Standalone): -145 dBm**
Acquisition time	Hot start: 1 s Warm start: 29 s Cold start: 32 s
Accuracy	Horizontal: < 2m (50 %); < 5 m (90 %) Altitude: < 4 m (50 %); < 8 m (90 %) Velocity: < 0.2 m/s

Table 29: Technical parameters of GPS

* Tracking sensitivity is the lowest GPS signal level for which the device can still detect an in-view satellite 98 % of the time when in sequential tracking mode.

** Acquisition sensitivity is the lowest GPS signal level for which the device can still detect an in-view satellite 50 % of the time.

7.5 Technical parameters of WiFi

WiFi	
Antenna connector	R-SMA – 50 Ohms
Supported WiFi band	2.4 GHz
Standards	802.11b, 802.11g, 802.11n
Type of device	Access point, station
Wi-Fi TX Output Power	17,3 dBm
Wi-Fi RX Sensitivity	-96,3 dBm

Table 30: Technical parameters of WiFi

7.6 Technical parameters of I/O port

- Characteristics of inputs:

logical 0 / 1	Voltage	Current
log. 0 max	3 V	0.4 mA
log. 1 min	5 V	0.7 mA
log. 1 type	12 V	2 mA
log. 1 max	60 V	7 mA

Table 31: Characteristics of inputs

- Binary output parameters:
  - 60 V AC / 300 mA
  - 60 V DC / 300 mA

7.7 Other technical parameters

Other technical parameters	
CPU power	2 DMIPS per MHz
Flash memory	256 MB
RAM	512 MB
M-RAM	128 kB

Table 32: Other technical parameters

8. Recommended Literature

[1] Conel: **Start guide**,
[2] Conel: **Configuration manual for v3 routers**.

9. Troubleshooting

If you can not connect to the router from your PC, your network card may be configured the way it is not possible to connect to the router. Take one or more of the following steps to solve the problem:

- Select the communication rate 10 MB/s in the properties of your network card.
- Connect the router to the PC via Switch.
- Connect the router to the PC, start the router first and then start the PC after the router's initialization.

9.1 FAQ

✍ **I have NAT enabled. My equipment is not connecting to the network.**

- *The device's gateway has to be configured as the router.*

✍ **The router resets itself and the Ethernet connection fails.**

- *The router will not function without an antenna. Keep the antenna as far as possible from the power supply.*

✍ **I can't access the Web server over NAT.**

- *The remote HTTP access of the router has to be disabled, the default server address has to be your web server and the gateway of the web server has to be the IP of the router.*

✍ **Mobile WAN connection fails. (DAT LED off)**

- *Check signal power. If signal power is weak, you will have to use a better antenna. If the neighboring cells have a similar signal strength, you will need to use a directional antenna. For proper operation, the signal levels have to be in the range from -50dBm to -90dBm.*
- *It is necessary to set ping, which will check the connection and, in the case of failed ping, restart connection.*

✍ **Mobile WAN connection cannot be established. (DAT LED off)**

- *Recheck GPRS settings - APN, name, password and IP address.*
- *Try to enter PIN – verify if the SIM card has the PIN code set.*
- *In a private APN, switch the DNS server send off.*
- *Switch the system log on and observe where the error occurs.*

✍ **Ethernet connection fails or isn't establishing.**

- *It is possible to turn auto negotiation off and set a rate and duplex manually on the Ethernet interface of the router.*

✍ **DynDNS doesn't function.**

- *With private APN this is not functional.*
- *If the same IP address is recorded in your canonic name as dynamically assigned address, it means that the operator is using NAT or firewall.*
- *Verify NAT using ping to the static server address.*
- *Verify Firewall accessing remotely to the router's Web interface.*
- *The operator may not provide the address of DNS server and without DNS server's adress it is impossible to connect to the dyndns.org server. There will be these messages in the system log:*
  - *DynDNS daemon started*
  - *Error resolving hostname: no such file or directory*
  - *Connect to DynDNS server failed*

✍ **L2TP or IPSec isn't establishing.**

- *Check the system log for error messages.*

✍ **I switched the router to offline mode by SMS message, but the router is in online mode after restart.**

- *SMS messages do not change the router configuration. They remain in effect only until the router is restarted.*

✍ **FTP doesn't function.**

- *Router doesn't support active FTP mode. It supports passive mode only.*

✍ **RS-232 doesn't function.**

- *Verify that the router supports RS-232 communications. Also verify the RS-232 communication settings. To do so, open the router's configuration menu via the web browser, select the appropriate expansion port and verify the settings in the configuration menu.*

10. Customers Support

10.1 Global Customer Support

You can find up to date information about this product on our website:

www.conel.com

Upkeep-advices:

- The SIM-card must be handled carefully as with a credit card. Don't bend, don't scratch on this and do not expose to static electricity.
- During cleaning of the router do not use aggressive chemicals, solvents and abrasive cleaners!

Conel Company hereby declares that the router narrated in this user's guide fits all basic demands of directive 1999/5/EC (R&TTE).

Router fits values of coefficient SAR defined by association ICNIRP and values of "About protection of health before non-ionized radiation".

CE Declaration of Conformity was issued and it is possible to find it on the Conel website (http://www.conel.com/download) [1] or at producer.

10.2 Customer Support for NAM

Up to date product information is on the website:

www.bb-smartworx.com

For Technical Support:

Call 815-433-5100

[1] Please, use the following login information: Username – ConelFreeDownload, Password – coneldownload.